Docket No. 55567
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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

APPLICANT:	C. Willkens		
SERIAL NO.:	10/090,468	GROUP:	3742
FILED:	March 4, 2002	EXAMINER:	J. Jeffrey
FOR:	CERAMIC IGNITERS		

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Commissioner of Patents
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APPEAL BRIEF

Applicant respectfully appeals the decision of the Examiner, dated June 27, 2005, finally rejecting claims 1-11, 14-19 and 21-33.

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I. REAL PARTY IN INTEREST

The real party in interest is Saint-Gobain Ceramics & Plastics LLC of Worcester, Massachusetts. An assignment from the inventors to Saint-Gobain Ceramics & Plastics LLC was recorded on July 17, 2002 at Reel/ Frame 013009/0967.

II. RELATED APPEALS AND INTERFERENCES

There are no related appeals or interferences known to Appellant or Appellant's representatives that will directly affect or be directly affected by or have a bearing on the Board's decision in the pending Appeal.

III. STATUS OF THE CLAIMS

Claims 1-33 have been presented in this application.

Claims 12, 13, and 20 have been cancelled.

Claims 1-11, 14-19 and 21-33 have been finally rejected and presently are on appeal (see the attached Appendix A).

IV. STATUS OF THE AMENDMENTS (AFTER FINAL REJECTION)

No amendments after final rejection have been presented.

V. SUMMARY OF CLAIMED SUBJECT MATTER

Appellant's claimed invention is directed to ceramic igniter devices that have a first conductive zone of relatively low resistance, a power enhancement or "booster" zone of intermediate resistance, and a further hot or ignition zone of relatively higher resistance. See application at page 3, lines 17-20.

Appellant's representative independent claim 26

Appellant's independent claim 26 is representative of the subject matter on appeal and reads as follows:

> Claim 26. (previously presented) A sintered ceramic igniter element comprising a conductive zone, a power booster zone, and a hot zone,
>
> the booster zone having a PTCR and a resistivity greater than the conductive zone and less than the hot zone,
>
> the hot zone having a resistivity greater than the booster zone,
>
> wherein
>
> the hot zone path length is 2 cm or less;
>
> the igniter has a time-to-temperature value of 3 seconds or less;
>
> the room temperature resistance of the conductive zone is less than about 50 percent of the room temperature resistance of the booster zone; and
>
> the room temperature resistance of the booster zone is less than about 70 percent of the room temperature resistance of the hot zone.

Figure 1 of the application

Figure 1 of the application is reproduced immediately below and depicts an exemplary ceramic igniter element as Appellant claims.

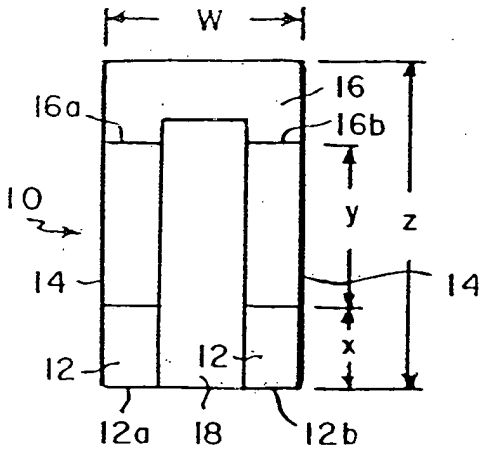

FIG. 1

In that Figure 1, igniter 10 includes conductive zones 12, adjoining power enhancement zones and a hot or ignition zone 16. In use, wire leads are connected to ends 12a and 12b of the conductive zone to supply power to the igniter, through booster zones 14 to hot zone 16. See application at page 8, lines 9-16.

Preferred igniters also may comprise an insulator region, such as centrally disposed heat sink 18 depicted in Figure 1. Among other things, such a heat sink region can prevent the igniter device from shorting (arcing). See application at page 8, lines 11-14. Such an insulator region is recited in Appellant's claims 23 and 24. See the attached Claims Appendix A.

Demonstrated rapid time-to-temperature performance

Appellant has surprisingly discovered that igniters of the invention can provide extremely fast time-to-ignition temperatures, include ignition times of 3 seconds or less, or even 2 seconds or less. See application at page 3, lines 8-31. This is demonstrated for instance by the results shown in Example 2 at page 15, lines 10-15 of the application, where ignition temperature was reached in less than 1 second.

Such results are clearly significant. Appellant's preferred rapid-ignition ceramic igniters can replace spark ignition systems where an extremely fast time-to-temperature is required. This is discussed for instance at page 3, line 28 through page 4, line 3 of the application as follows:

> It has been surprisingly found that igniters of the invention can provide extremely high speeds, including time-to-temperature of less than two seconds, and even less than about one-and-one half seconds or about one second, at both nominal voltages and low-end line voltages (85 percent of a specified nominal voltage). See, for instance, Example 2 which follows. Thus, for the first time, ceramic igniters are provided that can replace spark ignition systems where an extremely fast time-to-temperature is required, e.g. for an ignition source for instantaneous water heating systems, cooktops, and the like.

All the pending claims call for a rapid time-to-temperature value. See independent claims 1 and 26 as well as dependent claims 16, 25, 27, and 33.

Hot zone path lengths of 2 cm or less

Appellant also has found that an excessive hot zone path length can compromise performance, particularly the time to reach ignition temperature. See the application at page 8, line 32 through page 9, line 2. In reference to Figure 1 of the application reproduced above, the hot zone path length is the minimum distance from points 16a to 16b. See the application at page 8, lines 31-32.

All the pending claims call for a hot zone path less of 2 cm or less.

Dr. Yu's Rule 132 Declaration of record

Of record is the Rule 132 Declaration of Dr. Taehwan Yu which details comparative data that demonstrate that ignition speed (i.e. time to targeted ignition temperature) decreases and temperature is reduced with increases in electrical path length of resistive hot zones of otherwise comparable igniter elements that have booster zone regions. A copy of Dr. Yu's Declaration is provided herewith at Evidence Appendix B. Dr. Yu's Declaration was filed on February 26, 2004.

VI. ISSUE TO BE REVIEWED ON APPEAL

A single issue in on appeal:

Whether claims 1-11, 14-19 and 21-23 are unpatentable under 35 U.S.C. §103 over Axelson (U.S. Patent 5705261) in view of Willkens (U.S. Patent 5786565).

VII. ARGUMENT

1. Brief summary

A single Section 103 rejection based on two documents is outstanding in this case. The rejection can not be sustained.

The proposed combination is not proper. No inventive would have existed to so carefully select and combine particular features of the two cited documents as has been proposed in the outstanding final rejection. The cited Willkens patent effectively teaches *against* the proposed combination.

The cited documents also do not disclose or otherwise suggest Appellant's claimed invention. In particular, the documents do not disclose hot zone lengths or ignition time-to-temperature values in an igniter having more than two zones of differing resisitivity as Appellant claims. The cited documents also do not disclose booster zone operational temperatures, resistance differences of the booster zone relative to other igniter zones, and booster zone path length as Appellant claims.

Still further, the comparative results of record effectively rebut any *prima facie* case under Section 103 that may be contended to exist.

The rejected claims do *not* stand or fall together since each claim is considered separately patentable in its own right. Appellant believes that all of the claims under appeal are separately patentable including for reasons set forth below.

2. Examiner's position

It is acknowledged that neither of the cited documents alone renders obvious Appellant's claimed invention.

The position is nevertheless taken that it would have been obvious to carefully select and combine isolated feature of Axelson (U.S. Patent 5705261) in view of Willkens (U.S. Patent 5786565) and that careful combination would have rendered Appellant's claimed invention obvious.

In particular, it is acknowledged that the primary citation of Axelson does not disclose a hot zone path length of 2 cm or less as Appellant claims, but the position is taken that the cited Willkens patent reports a hot zone path length of 0.5 cm and that it would have been obvious to incorporate that hot zone into the Axelson system. See page 3 of the Final Office Action dated May 27, 2005.

It is further acknowledged that the primary citation of Axelson does not disclose a central insulator zone as Appellant claims, but the position is taken that the cited Willkens patent reports a central insulator zone and that it would have been obvious to incorporate that insulator zone into the Axelson device. See page 3 of the Final Office Action dated May 27, 2005.

Additional claimed aspects of Appellant's invention are acknowledged not to be disclosed in the cited documents – including ranges of conductor-to-booster zone resistivity, ranges of booster-to-hot zone resistivity, and booster zone length. However, in the final rejection, the position has been taken without any support from the prior art that such claimed features "are readily discoverable by routine experimentation by skilled artisans" and therefore not patentable.[1] See page 4 of the Final Office Action dated May 27, 2005.

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[1] As discussed in the Argument section which follows, an unsupported allegation that claimed subject matters "are readily discoverable by routine experimentation by skilled artisans" is clearly improper and basis itself to reverse the final rejection in this case. See, for instance, Section 2143.03 of the Manual of Patent Examining Procedure, which mandates: "To establish *prima facie* obviousness of a claimed invention, all claim limitations must be taught or suggested by the prior art."

At page 5-7 of the Final Office Action dated May 27, 2005, the comparative data of Dr. Yu's Rule 132 Declaration of record are characterized as being expected from the disclosure of the cited Willkens patent, even though that cited patent does not disclose igniters having a booster zone as Appellant claims.

3. Appellant's arguments

A. No incentive would have existed to combine the cited documents as proposed by the final rejection.

The entire rejection is based on an intermediate portion 14 reported in the of Axelson patent.

That intermediate portion 14 is as being ***preferably omitted*** for ease of manufacture. See the cited Axelson patent at col. 4, lines 30-32.

In the Examples of the Axelson patent, an intermediate zone is ***not*** described.

Additionally, the Axelson patent reports igniters that contain an interior void space, i.e. a hairpin or "slotted" igniter that does not contain an interposed heat sink zone.

The cited disclosure of the Willkens patent is to an igniter where the hot zone directly adjoins cold, conductive zones and a heat sink zone. The Willkens patent does not mention an intermediate zone as reported in the Axelson patent.

Indeed, at column 3, lines 30-35, the cited Willkens patent notes the importance of the heat sink zone for the described system having a short hot zone length as follows:

> Without wishing to be tied to a theory, it is believed the added thermal mass of the heat sink significantly slows convective cooling of the hot zone, thereby allowing the hot zone to remain hot under convective cooling conditions despite its small size.

Thus, the cited Willkens patent effectively teaches *against* use of the reported short hot zone lengths in systems that do not include a heat sink.

Clearly, then, a skilled worker would *not* have had any particular incentive to select a single feature (hot zone length) of the cited igniter of the Willkens patent with a heat sink zone and insert that selected aspect into a distinct igniter that does not contain an interposed heat sink zone. This is particularly clear where the Willkens patent urges coupling an interposing heat sink region together with the described hot zone length.

B. The cited documents do not disclose or otherwise suggest Appellant's claimed invention.

As specifically acknowledged in the Final Office Action, the Axelson patent does not mention or otherwise suggest:

(1) booster zone operational temperatures as recited in Appellant's claims 6-8;

(2) resistance differences of the booster zone relative to other igniter zones as recited in Appellant's claims 9, 10, 11, 28 and 39; and

(3) booster zone path lengths as recited in Appellant's claims 21-22.

Indeed, in the Final Office Action, it is acknowledged that such claimed aspects of Appellant's invention are disclosed nowhere in the cited art, but the position is taken that those claimed subject matters "are readily discoverable by routine experimentation by skilled artisans." This position is completely unsubstantiated.

Such a position can not be sustained and is clear basis for reversal of the final rejection in this case. In fact, reversal of the final rejection here is required under Section 2143.03 of the Manual of Patent Examining Procedure, which mandates: "To establish *prima facie* obviousness of a claimed invention, all claim limitations must be taught or suggested by the prior art."

The Axelson patent also does not mention lengths of a hot zone, or the a hot zone path length, or the significance thereof, as Appellant discloses and claims. As discussed above and demonstrated by the comparative test results set forth in Dr. Yu's Declaration, the claimed hot zone path length of the present igniters having booster zones can be very important in achieving desired performance results.

If anything, the primary citation of the Axelson patent indicates use of quite long hot zone path lengths. Thus, Example 1 of the Axelson document states (column 5, lines 43-48 of the Axelson patent):

> A double-legged hairpin ("U-shaped") ceramic igniter as shown in FIG. 1 was prepared ... in accordance with the teachings of the Washburn patent. [i.e. U.S. Patent 5,045,237, see col. 4, lines 19-21 of Axelson].

The Washburn patent (i.e. U.S. 5,045,237, copy enclosed) discloses igniters having a hot zone path length well in excess of 2 cm. See, for instance, U.S. Patent 5,045,237 at col. 7, line 62 through col. 8, line 3 and Example I and II at cols. 9 through 12.

The cited Willkens patent does not remedy such shortcomings of the primary citation.

The cited Willkens patent does not report an igniter region that correspond to Appellant's booster zone. Therefore, Willkens does not disclose that the reported hot zone path lengths might be suitably employed with an igniter having more than two zones of differing resistivity as Appellants claim.

C. Comparative data of record effectively rebuts any *prima facie* case under Section 103 that may be contended to exist.

Moreover, while Appellant fully believes that a *prima facie* case under 35 U.S.C. 103 is not presented by the cited combination of documents, it is also believed that the test data of record fully rebuts any *prima facie* case that may be contended to exist.

Thus, as discussed above, the comparative test results set forth in Dr. Yu's Rule 132 Declaration of record show that insufficient hot zone temperatures and time-to-temperature values can be provided where an igniter with a booster has a hot zone path length in excess of 2 cm. See, in particular, Figures 1 and 2 of the Declaration.

D. Each of the claims on appeal is separately patentable:

The cited Axelson and Willkens patents also provide no suggestion of other aspects of Appellant's claimed invention.

For instance, claim 2 is separately patentable for the above-stated reasons and further because the cited documents fail to teach or suggest the igniter of claim 1 wherein the resistance of the booster zone permits i) current flow to the igniter hot zone and ii) resistance heating of the booster region during use of the igniter. As discussed above, the Axelson document is completely silent regarding any operational effects of the described system.

Claim 3 is separately patentable for the above-stated reasons and further because the cited documents fail to teach or suggest the igniter of claim 1 or 2 wherein the resistance of the booster zone increases during application of current through the igniter and heating of the booster zone. Axelson – the sole document relied on for a report of something analogous to Appellant's claimed booster zone – is completely silent regarding any type of operational effects of an igniter having more than two zones of differing resistivities. Axelson does not exemplify an igniter having more than two zones of differing resistivities.

Claims 5 and 6 each is separately patentable for the above-stated reasons and further because the cited documents fail to teach or suggest the igniter of claim 1 wherein the three zones (conductive, booster, hot) differ in operational temperature during use of the igniter. None of the cited documents disclose operational performance of an igniter having more than two

zones of differing resistivities as Appellant claims.

Claim 6 is separately patentable for the above-stated reasons and further because the cited documents fail to teach or suggest the igniter of claim 5 wherein the hot zone has a higher operational temperature than the booster zone, and the booster zone has a higher operational temperature than the conductive zone. As discussed above, Axelson – the sole document relied on for a report of something analogous to Appellant's claimed booster zone – is completely silent regarding any type of operational effects of an igniter having more than two zones of differing resistivities.

Claim 7 is separately patentable for the above-stated reasons and further because the cited documents fail to teach or suggest the igniter of claim 1 wherein the booster operational temperature is about 200°C higher than the operational temperature of the conductive zone. None of the cited documents disclose operational performance of an igniter having more than two zones of differing resistivities as Appellant's claim.

Claim 8 is separately patentable for the above-stated reasons and further because the cited documents fail to teach or suggest the igniter of claim 1 wherein the booster operational temperature is at least about 100°C less than the operational temperature of the hot zone. None of the cited documents disclose operational performance of an igniter having more than two zones of differing resistivities as Appellant claims.

Claim 9 is separately patentable for the above-stated reasons and further because the cited documents fail to teach or suggest the igniter of claim 1 wherein the room temperature resistance of the conductor zone is less than about 50 percent of the room temperature resistance of the booster zone. In the Final Office Action dated May 27, 2005, it is argued without any support from the prior that resistance differences recited in claim 9 "are readily discoverable by routine experimentation by skilled artisans." Such an unsubstantiated allegation can not sustain a Section 103 rejection. See, for instance, MPEP §2143.03, as discussed above.

Claim 10 is separately patentable for the above-stated reasons and further because the cited documents fail to teach or suggest the igniter of claim 1 wherein the room temperature resistance of the booster zone is less than about 70 percent of the room temperature resistance of the hot zone. In the Final Office Action dated May 27, 2005, it is argued without any support from the prior that resistance differences recited in claim 10 "are readily discoverable by routine experimentation by skilled artisans." Such an unsubstantiated allegation can not sustain a Section 103 rejection. See, for instance, MPEP §2143.03, as discussed above.

Claim 11 is separately patentable for the above-stated reasons and further because the cited documents fail to teach or suggest the igniter of claim 1 wherein the operational temperature resistivity of the booster zone is at least about 50 percent greater than the operational temperature resistivity of the hot zone. In the Final Office Action dated May 27, 2005, it is argued without any support from the prior that resistivity differences recited in claim 11 "are readily discoverable by routine experimentation by skilled artisans." Such an unsubstantiated allegation can not sustain a Section 103 rejection. See, for instance, MPEP §2143.03, as discussed above.

Claim 14 is separately patentable for the above-stated reasons and further because the cited documents fail to teach or suggest a method of igniting gaseous fuel comprising applying an electric current across an igniter an igniter of claim 1.

Claim 15 is separately patentable for the above-stated reasons and further because the cited documents fail to teach or suggest the igniter of a method of claim 14 wherein the current has a nominal voltage of 6, 8, 10, 12, 24, 120, 220, 230 and 240 volts. Use of such voltages with the claimed igniters is demonstrated in the examples of the application and in the results disclosed in Dr. Yu's Declaration.

Claim 16 is separately patentable for the above-stated reasons and further because the cited documents fail to teach or suggest a method of claim 14 or 15 wherein a hot zone of the igniter reaches at least about 1000°C within about one second of applying the current. Such fast time-to-temperature performance is specifically demonstrated in Example 2 of the present application as well as Dr. Yu's Rule 132 Declaration.

Claim 17 is separately patentable for the above-stated reasons and further because the cited documents fail to teach or suggest a heating apparatus comprising an igniter of claim 1. As discussed above, igniters of the invention are particularly suited for use in a heating apparatus.

Claim 18 is separately patentable for the above-stated reasons and further because the cited documents fail to teach or suggest a heating apparatus of claim 17 that is an instantaneous water heater. The fast time-to-temperature performance of Appellant's preferred igniters render the igniters particularly suitable for use in an instantaneous water hear. See page 13, lines 28-30 of the application.

Claim 19 is separately patentable for the above-stated reasons and further because the cited documents fail to teach or suggest a heating apparatus of claim 17 that is a cooking apparatus.

Claims 21 and 22 each is separately patentable for the above-stated reasons and further because the cited documents fail to teach or suggest the igniter of claim 1 wherein the booster zone path length is from about 0.1 to about 2 cm as recited in claim 21, or a booster zone path length is from 0.2 to 1 cm as recited in claim 22. As discussed above, Axelson – the sole document relied on for a report of something analogous to Appellant's claimed booster zone – is silent regarding such zone length.

Claims 23 and 24 each is separately patentable for the above-stated reasons and further because the cited documents fail to teach or suggest the igniter of claim 1 wherein the igniter

comprises a central heat sink zone. Axelson – the sole document relied on for a report of something analogous to Appellant's claimed booster zone – does not mention use of a central heat sink.

Claim 25 is separately patentable for the above-stated reasons and further because the cited documents fail to teach or suggest the igniter of claim 1 wherein the igniter has a time-to-temperature value of 2 seconds or less. Such fast time-to-temperature performance is specifically demonstrated in Example 2 of the present application as well as Dr. Yu's Rule 132 Declaration.

Claim 26 is separately patentable for the above-stated reasons and further because the cited documents fail to teach or suggest a sintered ceramic igniter element comprising a conductive zone, a power booster zone, and a hot zone,

the booster zone having a PTCR and a resistivity greater than the conductive zone and less than the hot zone,

the hot zone having a resistivity greater than the booster zone,

wherein the hot zone path length is 2 cm or less;

the igniter has a time-to-temperature value of 3 seconds or less;

the room temperature resistance of the conductive zone is less than about 50 percent of the room temperature resistance of the booster zone; and

the room temperature resistance of the booster zone is less than about 70 percent of the room temperature resistance of the hot zone.

As discussed above, the claimed booster zone resistance values as recited in claim 26 are described nowhere in any of the cited documents. The unsubstantiated allegation that such claimed features "are readily discoverable by routine experimentation by skilled artisans" is not a proper basis for rejection under 35 U.S.C. 103.

Claim 27 is separately patentable for the above-stated reasons and further because the cited documents fail to teach or suggest the ceramic element of claim 26 wherein the igniter has a time-to-temperature value of 2 seconds or less. Such fast time-to-temperature performance is specifically demonstrated in Example 2 of the present application as well as Dr. Yu's Rule 132 Declaration.

Claim 28 is separately patentable for the above-stated reasons and further because the cited documents fail to teach or suggest the sintered element of claim 26 wherein the room temperature resistance of the conductive zone is about 10 percent or less than the room temperature resistance of the booster zone. In the Final Office Action dated May 27, 2005, it is argued without any support from the prior that resistance differences recited in claim 28 "are readily discoverable by routine experimentation by skilled artisans." Such an unsubstantiated allegation can not sustain a Section 103 rejection. See, for instance, MPEP §2143.03, as discussed above.

Claim 29 is separately patentable for the above-stated reasons and further because the cited documents fail to teach or suggest the sintered element of claim 26 wherein the room temperature resistance of the booster zone is about 50 percent or less than the room temperature resistance of the hot zone. In the Final Office Action dated May 27, 2005, it is argued without any support from the prior that resistance differences recited in claim 29 "are readily discoverable by routine experimentation by skilled artisans." Such an unsubstantiated allegation can not sustain a Section 103 rejection. See, for instance, MPEP §2143.03, as discussed above.

Claim 30 is separately patentable for the above-stated reasons and further because the cited documents fail to teach or suggest the sintered element of claim 26 wherein the igniter is adapted for use at 6, 8, 10, 12 or 24 volts. Use of such voltages with the claimed igniters is demonstrated in the examples of the application and in the results disclosed in Dr. Yu's Declaration.

Claim 31 is separately patentable for the above-stated reasons and further because the cited documents fail to teach or suggest a method for igniting gaseous fuel, comprising applying an electric current across an igniter of claim 26, wherein the current has a nominal voltage of 6, 8, 10, 12 or 24 volts. Use of such voltages with the claimed igniters is demonstrated in the examples of the application and in the results disclosed in Dr. Yu's Declaration.

Claim 32 is separately patentable for the above-stated reasons and further because the cited documents fail to teach or suggest a method of claim 31 wherein the current has a nominal voltage of 24 volts. Indeed, comparative test results disclosed in Dr. Yu's Rule 131 Declaration (copy enclosed) include use of 24 volts.

Claim 33 is separately patentable for the above-stated reasons and further because the cited documents fail to teach or suggest a method of claim 31 wherein a hot zone of the igniter reaches at least about 1000°C within about one second of applying the current. Such fast time-to-temperature performance is specifically demonstrated in Example 2 of the present application as well as Dr. Yu's Rule 132 Declaration.

SUMMARY

Therefore, for the foregoing reasons, it is respectfully requested that the Board reverse the final rejection in this application.

Respectfully submitted,

Date: January 26, 2006

By: _____

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CLAIMS APPENDIX A

Claim 1. A sintered ceramic igniter element comprising a conductive zone, a power booster zone, and a hot zone,

the booster zone having a PTCR and a resistivity greater than the conductive zone and less than the hot zone,

the hot zone having a resistivity greater than the booster zone,

wherein the hot zone path length is 2 cm or less and the igniter has a time-to-temperature value of 3 seconds or less.

Claim 2. An igniter element of claim 1 wherein the resistance of the booster zone permits i) current flow to the igniter hot zone and ii) resistance heating of the booster region during use of the igniter.

Claim 3. An igniter element of claim 1 or 2 wherein the resistance of the booster zone increases during application of current through the igniter and heating of the booster zone.

Claim 4. An igniter element of claim 1 wherein the igniter comprises in sequence the conductive zone, the booster zone and the hot zone.

Claim 5. An igniter of claim 1 wherein the three zones differ in operational temperature during use of the igniter.

Claim 6. An igniter element of claim 5 wherein the hot zone has a higher operational temperature than the booster zone, and the booster zone has a higher operational temperature than the conductive zone.

Claim 7. An igniter element of claim 1 wherein the booster operational temperature is about 200°C higher than the operational temperature of the conductive zone.

Claim 8. An igniter element of claim 6 or 7 wherein the booster operational temperature is at least about 100°C less than the operational temperature of the hot zone.

Claim 9. An igniter element of claim 1 wherein the room temperature resistance of the conductor zone is less than about 50 percent of the room temperature resistance of the booster zone.

Claim 10. An igniter element of claim 1 wherein the room temperature resistance of the booster zone is less than about 70 percent of the room temperature resistance of the hot zone.

Claim 11. An igniter element of claim 1 wherein the operational temperature resistivity of the booster zone is at least about 50 percent greater than the operational temperature resistivity of the hot zone.

Claim 14. A method of igniting gaseous fuel, comprising applying an electric current across an igniter an igniter of claim 1.

Claim 15. A method of claim 14 wherein the current has a nominal voltage of 6, 8, 10, 12, 24, 120, 220, 230 and 240 volts.

Claim 16. A method of claim 14 or 15 wherein a hot zone of the igniter reaches at least about 1000°C within about one second of applying the current.

Claim 17. A heating apparatus comprising an igniter of claim 1.

Claim 18. `The apparatus of claim 17 wherein the apparatus is an instantaneous water heater.

Claim 19. The apparatus of claim 17 wherein the apparatus is a cooking apparatus.

Claim 21. The igniter of claim 1 wherein the booster zone path length is from about 0.1 to about 2 cm.

Claim 22. The igniter of claim 1 wherein the booster zone path length is from 0.2 to 1 cm.

Claim 23. The igniter of claim 1 wherein the igniter comprises a central heat sink zone.

Claim 24. The igniter of claim 23 wherein the igniter comprises a heat sink zone interposed between conductive, booster and hot zones of the igniter.

Claim 25. The igniter of claim 1 wherein the igniter has a time-to-temperature value of 2 seconds or less.

Claim 26. A sintered ceramic igniter element comprising a conductive zone, a power booster zone, and a hot zone,

the booster zone having a PTCR and a resistivity greater than the conductive zone and less than the hot zone,

the hot zone having a resistivity greater than the booster zone,

wherein the hot zone path length is 2 cm or less;

the igniter has a time-to-temperature value of 3 seconds or less;

the room temperature resistance of the conductive zone is less than about 50 percent of the room temperature resistance of the booster zone; and

the room temperature resistance of the booster zone is less than about 70 percent of the room temperature resistance of the hot zone.

Claim 27. The igniter element of claim 26 wherein the igniter has a time-to-temperature value of 2 seconds or less.

Claim 28. The igniter element of claim 26 wherein the room temperature resistance of the conductive zone is about 10 percent or less than the room temperature resistance of the booster zone.

Claim 29. The igniter element of claim 26 wherein the room temperature resistance of the booster zone is about 50 percent or less than the room temperature resistance of the hot zone.

Claim 30. The igniter element of claim 26 wherein the igniter is adapted for use at 6, 8, 10, 12 or 24 volts.

Claim 31. A method for igniting gaseous fuel, comprising applying an electric current across an igniter of claim 26, wherein the current has a nominal voltage of 6, 8, 10, 12 or 24 volts.

Claim 32. The method of claim 31 wherein the current has a nominal voltage of 24 volts.

Claim 33. The method of claim 31 wherein a hot zone of the igniter reaches at least about 1000°C within about one second of applying the current.

EVIDENCE APPENDIX B

Docket No. 55567

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

APPLICANT:	C. Willkens		
SERIAL NO.:	09/828,484	EXAMINER:	J. Jeffrey
FILED:	March 4, 2002	GROUP:	3742
FOR:	CERAMIC IGNITERS		

Commissioner For Patents
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DECLARATION UNDER 37 CFR 1.132

I, Taehwan Yu declare as follows:

1. I received a Ph.D. in Materials Science and Engineering from the Massachusetts Institute of Technology in 1996. From the year 2000 to the present, I have been employed by the Saint-Gobain Corporation, and I have conducted research in the areas of the design and development of ceramic igniters throughout that employment. My present job title is Senior Research Engineer.

2. I am familiar with the above-identified application.

3. I conducted the following experimental work. A series of 24 volt sintered igniter elements having differing hot zone (resistive zone) lengths were evaluated to assess the effect of hot zone electrical path length relative to speed (i.e. time to specified ignition temperature after applying electrical input to the igniter) and temperature. These tested sintered igniters corresponded to the igniter disclosed in Example 1 of the above-identified application and were of the same composition and general dimensions, but had differing hot zone lengths as specified below.

4. More specifically, a series of sintered igniter elements corresponding to the igntier of Example 1 of the above-identified application and having differing resistive zone electrical path lengths were measured for their speed and resistance at 20.4V and temperature and amperage at temperature and amperage at 20.4V, 24V and 26V. Average values of measurements on the tested igniter elements from each tile are reported in Table 1 below. Speed was measured by time to temperature (TTT) to 1050°C at 20.4V. TTT of more than 10 seconds and temperatures of less than 800°C are reported as N/A as it exceeded the measurement capabilities. Figures 1 and 2 set forth below show the average electrical path length in hot zone relative to average speed (@20.4V) and temperature (@24V) for each tested igniter. TTT of 10 seconds and temperature of 0°C were assigned in the below Figures to the igniters exceeding the limit of measurement capabilities. Overall, there is a correlation of longer electrical path length with slower TTT and cooler temperature at the tip of the igniter element. Longer electrical path length increases the room temperature resistance and thus lowers in-rush current that is needed for rapid heating to ignition temperature. Additionally, longer electrical path length increased the overall volume of the resistive hot zone further inhibiting rapid heating.

20.4V				24 V		26.4 V		Electrical path length
Temp ©	Amps (A)	TTT to 1050C (sec)	RTR (ohms)	Temp	Amps	Temp	Amps	(cm)
N/A	0.34	N/A	33.44	N/A	0.35	N/A	0.35	3.81
N/A	0.35	N/A	33.26	N/A	0.35	N/A	0.36	3.65
N/A	0.42	N/A	24.47	N/A	0.43	N/A	0.44	2.74
N/A	0.40	N/A	26.07	N/A	0.41	N/A	0.43	2.64
815	0.68	N/A	11.48	979	0.72	1062	0.76	1.16
776	0.64	N/A	13.49	951	0.68	1036	0.72	1.26
1135	1.07	4.25	6.07	1272	1.18	1346	1.28	0.45
1144	1.09	4.11	5.78	1283	1.20	1359	1.30	0.40
1216	1.31	2.41	5.74	1320	1.43	1383	1.55	0.35
1258	1.64	1.95	3.15	1349	1.79	1421	1.93	0.23
1268	1.63	1.85	3.26	1358	1.78	1435	1.91	0.15

Table 1. Average measured value of TTT (time to temperature to 1050°C) and RTR (room temperature resistance) at 20.4V and temperature and amperage at 20.4V, 24V and 26V for various electrical path lengths.

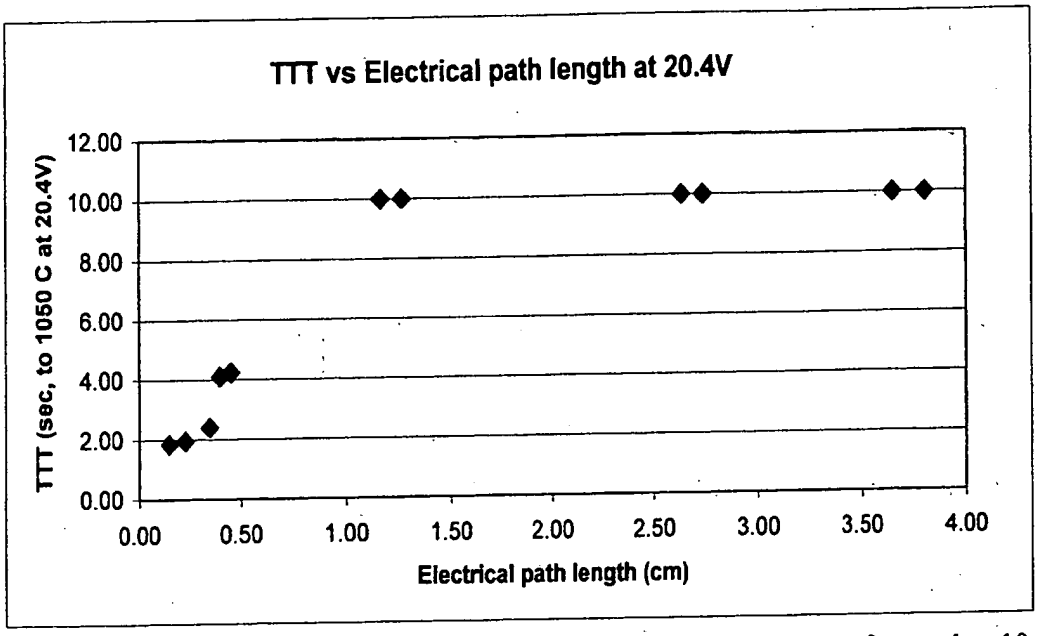

Figure 1. TTT vs. Electrical path length at 20.4V. Igniter elements with TTT of more than 10 seconds were assigned to 10 seconds in the figure.

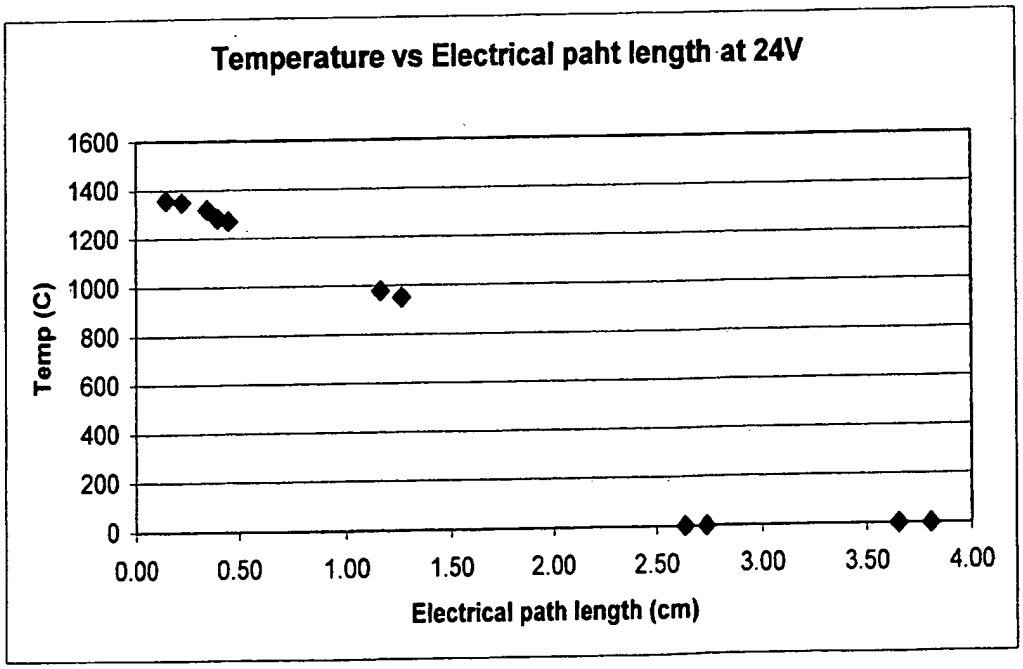

Figure 2. Temperature vs. Electrical path length at 24V. Elements with temperature of less than 800°C were assigned to 0°C in the figure.

5. The above results how that speed (i.e. time to targeted ignition temperature) decreases and temperature is reduced with increases in electrical path length of resistive hot zones of otherwise comparable igniter elements that have booster zone regions.

6. I hereby further declare that all statements made herein of my own knowledge are true and all statements made on information and belief are believed to be true, and further that these statements are made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, and that such willful false statements may jeopardize the validity of the above-identified application or any patent issued thereon.

Date: 1-30-2004

Taehwan YU

PATENTS APPENDIX C